United States Patent [19]

Konstant

[11] **3,854,686**

[45] **Dec. 17, 1974**

[54] **CANTILEVER RACK**

[75] Inventor: **Anthony N. Konstant,** Mt. Prospect, Ill.

[73] Assignee: **Speedrack Inc.,** Skokie, Ill.

[22] Filed: **June 21, 1972**

[21] Appl. No.: **264,784**

[52] **U.S. Cl.** **248/243,** 108/108, 211/148

[51] **Int. Cl.** **A47b 96/12,** A47f 5/01, A47f 5/16

[58] **Field of Search** 248/243, 244, 245, 246; 108/108, 109, 110; 211/148, 176, 153, 134

[56] **References Cited**

UNITED STATES PATENTS

723,677	3/1903	Kade	248/245
1,698,974	1/1929	Vance	248/234 UX
3,088,424	5/1963	Knuth	248/243 X
3,136,520	6/1964	Reese	248/243
3,369,789	2/1968	Harris	248/245
3,489,291	1/1970	Frazier	211/176
3,726,414	4/1973	Konstant	211/148

Primary Examiner—J. Franklin Foss
Attorney, Agent, or Firm—Fitch, Even, Tabin & Luedeka

[57] **ABSTRACT**

A rack structure having a horizontal cantilever arm which is adapted for rapid positioning on a vertical standard. The construction of the arm is such that it can be snapped into place on the standard without requiring any tools or fasteners.

9 Claims, 6 Drawing Figures

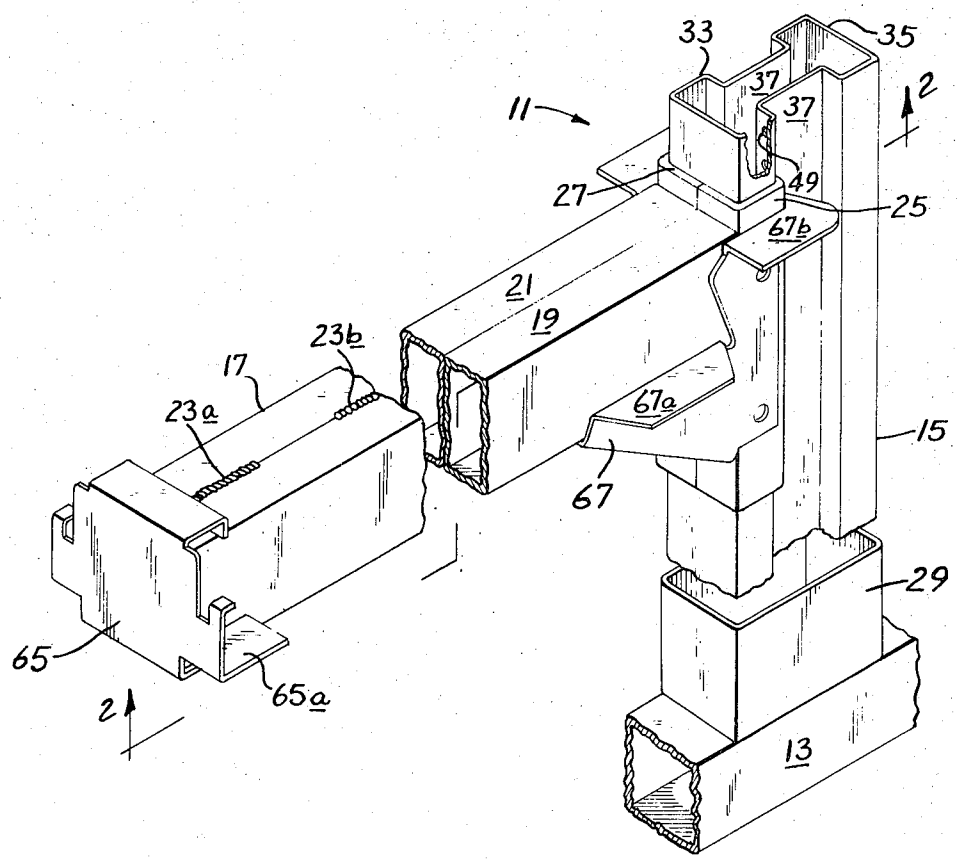

Fig. 1.

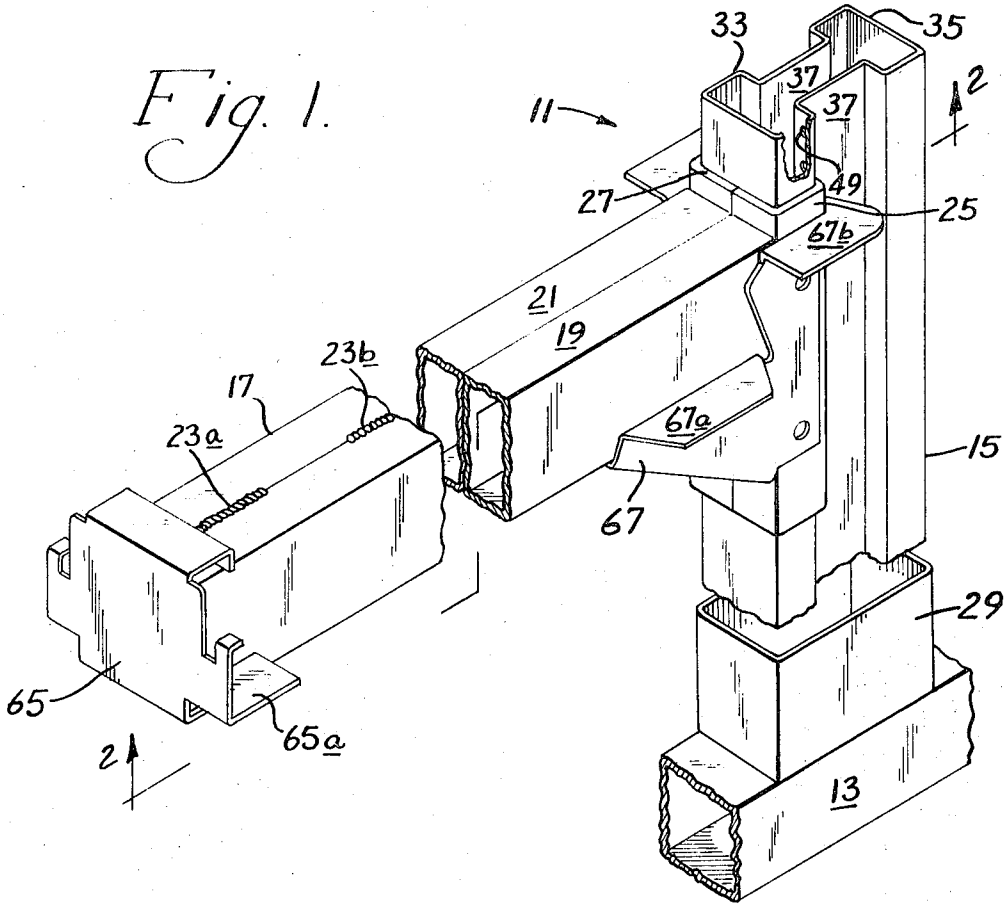
33
35
37
37
11
2
49
27
25
67b
21
19
23b
17
23a
67a
15
67
29
65
65a
2
13

Fig. 2

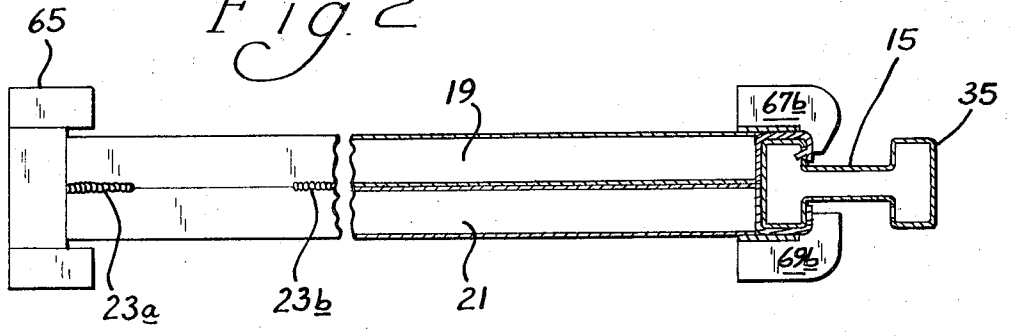
65
19
15
67b
35
23a
23b
21
69b

Fig. 3.

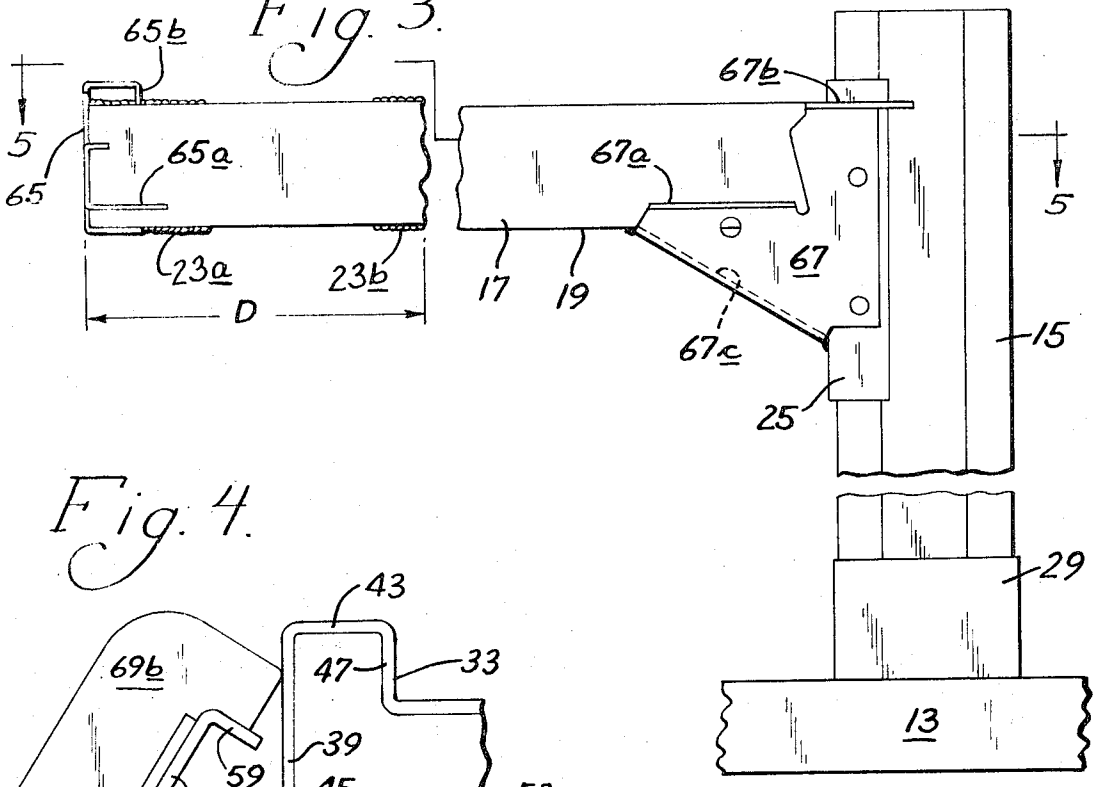

Fig. 4.

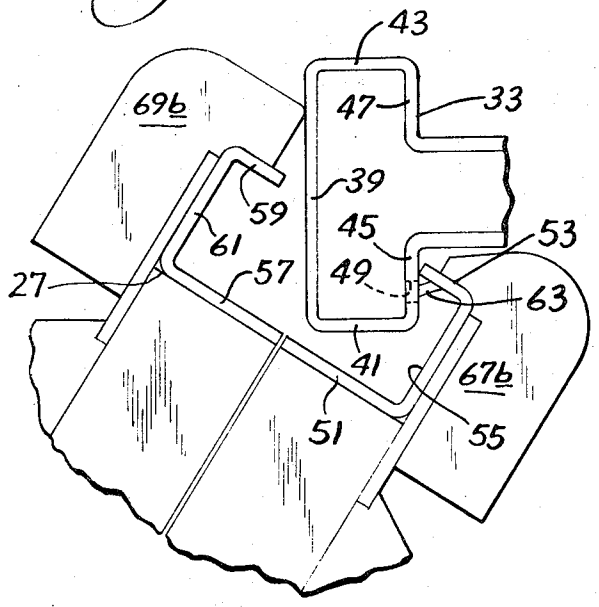

Fig. 5

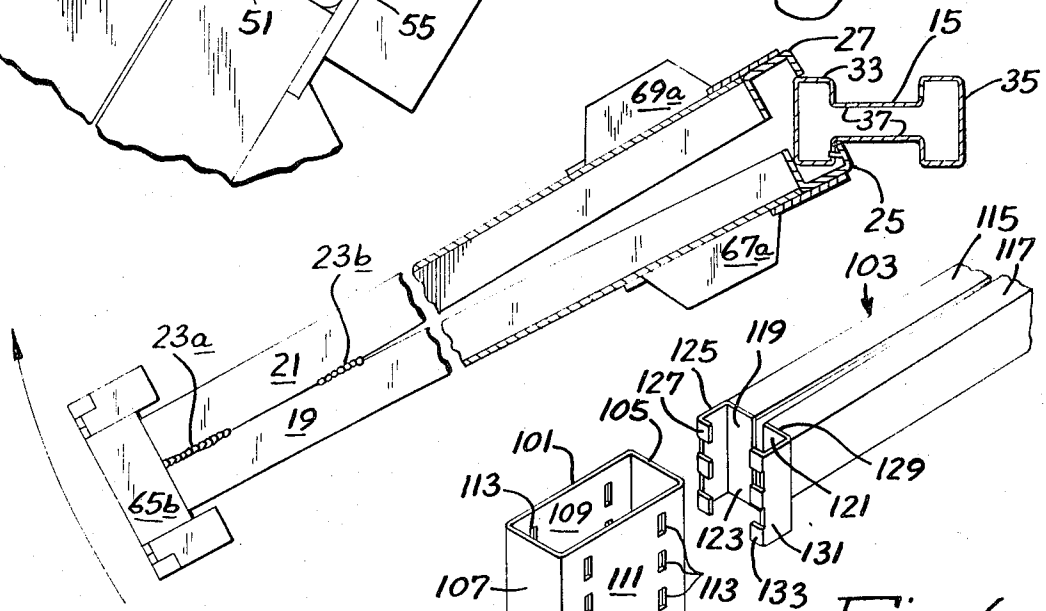

Fig. 6

CANTILEVER RACK

This invention relates to storage racks and more particularly to cantilever rack structures.

With floor space for storage purposes becoming increasingly more expensive, emphasis is being given to more efficient rack structures. Rack structures are desired by industry which are capable of simple and rapid assembly, and which can be disassembled and/or adjusted when desired. Cantilever racks provide efficient and versatile storage for many industries, and through their use it is often possible to make excellent utilization of scarce floor space.

It is an object of this invention to provide an improved cantilever rack structure. A further object is to provide an improved arm assembly for a cantilever rack. Another object is to provide an improved cantilever rack wherein the support arms can be attached without the use of additional parts.

Other objects of the invention will become apparent from the following detailed description when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a partially exploded perspective view of a cantilever rack structure incorporating various features of the present invention;

FIG. 2 is a bottom view, partially in cross section, taken generally along line 2—2 of FIG. 1;

FIG. 3 is a side elevational view of the structure of FIG. 1;

FIG. 4 is a fragmentary top view, enlarged in size, showing the structure of FIG. 1 as the cantilever arm is in the initial stage of attachment;

FIG. 5 is a view taken generally along line 5—5 of FIG. 3 showing a later stage of the attachment than that shown in FIG. 4; and

FIG. 6 is a fragmentary exploded view of an alternate embodiment of a cantilever rack structure.

Very generally, a cantilever rack structure **11** is shown in FIG. **1** which includes a horizontal base **13** which supports a column or standard **15** in an upright position upon which column is mounted one or more horizontal cantilever arms **17.** The cantilever arm **17** includes two elongated tubular members **19** and **21,** to the inner ends of which are affixed a pair of righthand and lefthand brackets **25** and **27,** respectively. The elongated tubular members **19,21** are joined in the region generally adjacent the outer ends thereof, as by lines of weld **23,** and they are unconnected adjacent their inner ends. Thus, the brackets **25,27** may be resiliently spread apart under force to an open condition in order to attach the cantilever arm **17** in desired position on the vertical standard **15.** When the arm **17** is in its desired erected position, the bracket-carrying ends of the tubular members **19,21** are allowed to snap back together, completing the attachment. In the illustrated embodiment, the brackets **25,27** circumscribe a portion of the standard **15** and effectively transfer the load from the cantilever arm **17** to the standard.

More particularly, the base **13** is provided with an upstanding tubular sleeve portion **29** which is adapted to receive the lower end of the standard **15** and support the standard in an upstanding position. The sleeve **29** has a rectangular interior opening that is proportioned to receive and fit closely about a portion of the periphery of the standard **15.**

The illustrated standard **15** may be thought of as comprising a pair of opposed C-shaped channel portions **33** and **35** interconnected by web members **37,** so that the cross section of the standard has the outline of an "I." Each channel portion furnishes a mounting surface for the bracket-carrying cantilever arms **17.** Usually, a plurality of cantilever arms **17** will be mounted on the forward channel portion **33** and on the rear channel portion **35** so that the arms extend forward and rearward from the standard in opposite directions. In many instances, two cantilever arms **17** will be mounted at the same horizontal level.

The front C-shaped channel portion **33** includes a front wall **39,** a right sidewall **41,** a left sidewall **43,** and right **45** and left **47** rear re-entrant walls which extend from each sidewall, respectively, in the same direction as the front wall **39** extends. The right rear re-entrant wall **45** of the channel portion **33** (and the corresponding wall of the channel portion **35**) is provided with a series of apertures **49** disposed in vertical alignment with one another and spaced a predetermined distance apart.

The two elongated members **19** and **21** should be each generally tubular in shape, as other structural shapes can result in the creation of torsion forces upon loading that will spread the unconnected bracket-carrying ends of the elongated members and cause detachment and/or falling of the cantilever arms **17.** The elongated members **19,21** are preferably steel tubes which are rigidly affixed to each other at a location generally adjacent the outer ends thereof by spaced lines of weld **23***a*,**23***b* or by some other suitable method of joinder, thereby causing the members to normally lie in contiguous relationship along their entire lengths.

The distance D (FIG. **3**) over which the joinder is effected will vary depending upon the length of the members **19** and **21,** the size and shape thereof, the weight of the metal stock and other factors which will influence the resiliency. Usually, the joinder of the members **19,21** does not extend to the inner half of the cantilever arm **17;** however, it is difficult to specify the length of joinder because of the variables involved. The unconnected portions should be of sufficient length to permit the bracket-carrying ends to be spread apart with the application of reasonable force, while the joinder over a finite distance D should provide sufficient residual biasing force in the arm **17** that the elongated members **19,21** will snap to their contiguous arrangement as soon as the spreading force is removed. Usually the members **19,21** will be unconnected for a distance of at least about **20** to **40** inches from the inner end of the arm **17** where the brackets **25,27** are located, and the joinder should preferably span a distance at least about 10 percent of the length of the tubular members. In the illustrated embodiment, the joinder is by spaced lines of weld **23***a* and **23***b*, disposed top and bottom of the arm **17;** however, bolts or other attaching means could also be used at the same locations. Obviously, the top and bottom weld lines could be continuous, but such additional strength is not deemed necessary.

The righthand bracket **25** and the lefthand bracket **27** are suitably attached, as by welding, to the unconnected inner ends of the tubular members **19,21,** and they serve to attach or mount the cantilever arm **17** on the standard. The brackets **25,27** extend slightly above and to a greater distance below the upper and lower surface of the tubular members **19** and **21** and thereby

provide an extended surface to abut the surface of the front wall **39** of the standard **15.** The bracket **25** has a pair of parallel flanges **51** and **53** interconnected by a perpendicular web **55,** thus having the general shape of a U. The bracket **27** has similar front and rear flanges **57,59** interconnected by a web **61.** A stud or lug **63** proportioned to fit into the apertures **49** in the standard extends forward from the rear flange **53** of the right-hand bracket **25.** In the illustrated embodiment, the lug **63** is punched from the rear flange **53.** To locate the cantilever arm **17** at the desired horizontal level on the standard, the stud **63** is aligned with the appropriate aperture **49,** and then mounting is carried out as described hereinafter.

Decking supports are provided on both ends of the cantilever arm **17.** At the outer end of the arm, there is a single support **65** having support surfaces **65***a* located on both sides of the arm **17** and an upper abutment **65***b*. On the inner ends of the tubular members **19** and **21,** there are affixed a righthand support **67** and a lefthand support **69.** The righthand support **67** has a lower **67***a* and an upper **67***b* support surface; the left support **69** is correspondingly formed to have lower **69***a* and upper **65***b* support surfaces. The inner rear corner of the upper shelf support **67***b* (see FIG. **4**) is slightly cutoff to provide clearance, as described later in detail.

These support surfaces are designed to provide support for shelving material, such as wooden planks or decking. A storage rack installation will generally have a number of aligned vertical standards **15** each having horizontal arms **17** mounted at the same vertical levels. The front shelf support surfaces **65***a* correspond in vertical level with the rear shelf support surface **67**a and may be used to support stringers or a skeleton deck frame extending between adjacent cantilever arms **17,** which in turn will support horizontal shelving as a part of the rack structure. Such stringers or frames would usually have an upper surface that would be flush with the upper surface of the cantilever arm **17** and the support surfaces **67***b* and **69***b* so that decking can provide a continuous flat surface extending for a substantial distance. When such an arrangement is used, the upstanding abutments **65**b are used to prevent such decking from shifting forward.

Referring to FIG. **3,** it is noted that when the cantilever arm **17** is attached to the vertical standard **15** and is unloaded, the outer end of the arm lies slightly vertically above the inner end of the arm which is attached to the standard. This slight angle of slope compensates for the deflection the arm will undergo so that it will be in horizontal alignment when fully loaded, and in the illustrated embodiment, a ⅜-inch rise is provided for each 12 inches of length.

The decking supports **67** and **69** double as braces at the points of interconnection between the elongated members **19,21** and their respective brackets **25,27.** The inner ends of the elongated members are suitably affixed perpendicularly to the front flanges **51,57** of the brackets, as by welding. To brace this connection, the supports **67** and **69** are provided with flanges **67***c* and **69***c* which underlie the respective elongated members **19,21** and extend diagonally from points on the undersurface of the members to a location near the lower end of the bracket front flanges **51,57.** The supports **67** and **69** are appropriately welded to the elongated members **19,21** and to the brackets **25,27,** as for example along both the upper and lower edges of the diagonal flanges **67***c* and **69***c*. Additional welding is generally provided between the upper portion of the supports **67,69** and the sidewalls of the elongated tubes **19,21.** This bracing strengthens the interconnection between the elongated tubes **19,21** and the brackets **25,27** and assists in the transfer of the supported load from the cantilevered arms **17** to the vertical standard **15** via the brackets.

To attach the arm **17** to the vertical standard **15,** the bracket-carrying ends of the resilient tubular members **19,21** are spread apart to an open condition. As shown stepwise in FIGS. **4** and **5,** the righthand and lefthand brackets **25** and **27** can be separated sufficiently so that they will move into a partially circumscribing position about the front channel portion **33** of the vertical standard. As soon as the spreading force on the elongated members **19,21** is released, the brackets **25,27** will snap into a closed position about the front channel portion **33** as shown in FIGS. **1** and **2.**

When the brackets are positioned on the standard, the lug **63** is interengaged with the appropriate aperture **49** in the right rear reentrant surface **45** of the standard and holds the cantilever arm **17** in place even when there is no load on the arm. When a load is placed on the cantilever arm **17,** a moment force in a vertical plane is imparted to the brackets **25, 27** which presses the lower portion of the interior surfaces of the bracket front flanges **51,57** against the front wall **39** of the standard and presses the upper portions of the rear flanges **53,59** against the rear-facing surfaces of the re-entrant walls **45,47** of the standard adjacent which they lie. The forces thus developed between these surfaces and the engagement of the lug **63** in the aperture **49** prevent relative vertical movement and support the cantilever arm **17** in position at the desired vertical height on the standard **15.**

The interengagement of the brackets **25,27** and the standard **15** are conveniently availed of to spread the inner ends of the elongated tubes **19,21** sufficiently horizontally apart to permit attachment. Referring to FIGS. **4** and **5,** the cantilever arm **17** is initially located at the desired vertical level on the standard **15** but disposed at an angle counterclockwise from the load-bearing position it will ultimately assume. The lug **63** is loosely engaged in the appropriate aperture **49.** The arm **17** is then rotated clockwise, generally pivoting about the lug **63** and the side edge of the flange **53,** causing first the corner of shelf support **69***b*, and subsequently the vertical side edge of the flange **59** of the bracket **27,** to bear against the front wall **39** of the standard. The continued clockwise rotational movement of the cantilever arm **17** causes the edge of the bracket front flange **59** to slide around the front lefthand edge of the standard **15** onto the sidewall **43** (as depicted in FIG. **5**), forcing the inner ends of elongated tube **19,21** to which the brackets **25** and **27** are attached to be spread apart.

More particularly, the force acting against corner of support flange **69***b* is substantial (because of the leverage provided by the length of the arm **17**), and the support **69** and the tube **21** to which it is welded is caused to move horizontally away from bracket **25.** The corner slides along the front wall **39,** spreading the brackets and the elongated members **19,21** until the corner of the support **69**b projects beyond the front surface **39** of the standard, at which time the edge of bracket rear flange **59** contacts the front surface **43.** The vertical

edge of bracket rear flange **59** slides along the front surface **39** until it passes the lefthand edge, as depicted in FIG. **5**, and then it slides along sidewall **43** until it reaches the rear edge thereof, at which time the bracket **27** snaps into place with the flange **59** lying adjacent the rear surface **47** of the standard. When the bracket **27** snaps into the closed condition, the attachment of the arm **17** is complete. The cantilever arm **17** can be removed from the standard **15** by inserting a simple tool between the inner portions of the elongated members **19,21** and using it to spread the members apart while rotating the cantilever arm in a counterclockwise direction.

From this description, it may be seen that the present invention provides an improved cantilever rack structure which provides versatile shelving support and which is capable of simple and rapid assembly and disassembly. The structure requires no loose parts for the attachment of the arms and thereby facilitates efficient erection and subsequent adjustment.

Depicted in FIG. **6** is an alternative embodiment that might be employed as a part of a rack structure utilizing this general concept. FIG. **6** illustrates a vertical standard **101** and a cantilever arm **103** which are shown as a part of an exploded perspective view. The vertical standard **101** is a tubular structure of generally rectangular cross section having four walls which are termed, for purposes of description, a front wall **105,** a rear wall **107** and a pair of sidewalls **109** and **111.** The attachment of the cantilever arm **103** to the standard **101** is carried out via the provision of rows of rectangular apertures **113** disposed in the sidewalls **109** and **111.** The apertures **113** in each row are spaced vertically apart a uniform distance, and each of the rows is located a uniform distance from either the front wall **105** or the rear wall **107.**

The cantilever arm **103** includes a pair of elongated rectangular tubes **115** and **117** which are welded together near the outer ends thereof in precisely the same manner as the tubes **19** and **21** illustrated in FIG. **1.** A righthand supporting bracket **119** and a lefthand supporting bracket **121** are respectively welded to the inner ends of the elongated tubes **115** and **117.** The righthand bracket **119** has a front flange **123,** a side flange **125** that is generally perpendicular thereto and a series of re-entrant lugs **127** which extend generally transverse to the side flange **125.** The lugs **127** are proportioned and are spaced uniform distances apart so as to be received by the rectangular apertures **113** disposed in the sidewall **109** of the standard **101.** The lefthand bracket **121** is similarly constructed having a front flange **129** and a substantially perpendicular side flange **131** which carries a plurality of re-entrant lugs **133** along its rear vertical edge, which lugs are proportioned and spaced to be received by the apertures **113** in the sidewall **111.**

Accordingly, when it is desired to attach the cantilever arm **103** to the standard **101,** one set of the lugs, for example, the lugs **133,** are placed in registration with the apertures **113** in the sidewall **111.** The cantilever arm **103** is then rotated counterclockwise so that the vertical edges of the three lugs **127** slide along the surface of the front wall **105** of the standard. After the lugs **127** pass the side edge, further rotation of the cantilever arm **103** causes them to slide rearward along the sidewall **109** until they reach the apertures **113,** at which time they will snap into place, thus completing attachment of the cantilever arm **103** to the standard **101.**

When the cantilever arm **103** is loaded, the load is transferred to the brackets **119** and **121** causing the lower portions of the front flanges **123** and **129** to be pressed against the front wall **105** of the standard and the uppermost of the re-entrant lugs **127,133** to bear against the corresponding edges of the apertures **113.** Suitable supports (not shown) may be used to brace the connection between the tubes **115,117** and the brackets **119,121** and to also provide surfaces upon which decking can be supported.

While particular embodiments of the invention have been illustrated and described, it should be apparent that various modifications may be made thereto without departing from the scope of the invention which is defined by the claims appended hereinafter. For example, in the structure shown in FIGS. **1** through **5,** instead of disposing the lug **63** in the rear flange **53** of the bracket, a lug may be disposed in the side flange **55** of the bracket **25** with the apertures **49** then being appropriately located in the sidewall **41** of the standard. Similarly, an additional lug could be located in the side flange **61** of the bracket **27** with apertures being similarly provided in the adjacent sidewall **43** of the standard. By providing lugs in both brackets, it would then be possible to attach the cantilever arm **17** to the standard **15** by beginning from either side and rotating the arm appropriately; in which instance, the corner of the support flange **69***b* (see FIG. **4**) would be cut off similar to the flange **67***b* to provide clearance when the cantilever arm is installed from the side opposite to that shown in FIG. **4.**

Various of the features of the invention are set forth in the following claims.

What is claimed is:

1. A cantilever storage rack structure comprising an elongated vertical standard having a front surface, a pair of side surfaces extending rearward from said front surface and a re-entrant surface extending inward from the rear end of each of said side surfaces, and a cantilever support arm having an inner end for attachment to said standard so that it extends from said front surface thereof and an outer end that will be spaced from said standard, which arm includes a pair of elongated generally horizontal tubular members and means joining said elongated members together at at least spaced points generally adjacent said outer end of said support arm and thereby causing said elongated members to normally lie in contiguous relationship at said inner end of said support arm, and which support arm also includes a bracket affixed to the inner end of each of said elongated tubular members for attaching said support arm to said standard, said brackets each having a first flange portion for abutting said front surface of said standard when attached thereto, a second portion extending rearward from said first flange and a re-entrant flange element extending from said second bracket portion in the same direction as said first flange and generally abutting said re-entrant flange of said standard, said elongated members being unconnected to each other for a substantial distance adjacent the inner end of said support arm and the free edges of said re-entrant flange elements being so spaced apart that, when one said flange element is located in contact with one said re-entrant surface of said standard and said cantilever arm is rotated, said tubular members are resiliently spread

apart as a result of said rotation to an open condition and thereafter snap back together in partially circumscribing relationship about said standard at a location intermediate its upper and lower ends, said support arm tubular members even when loaded remaining in said snapped together condition without additional attachment.

2. A structure in accordance with claim **1** wherein said standard and at least one of said brackets are provided with interengaging means, said interengaging means preventing downward movement of said support arm when attached to said standard.

3. A structure in accordance with claim **2** wherein said interengaging means includes an aperture and a protuberance, said protuberance being adapted to be received in said aperture.

4. A structure in accordance with claim **1** wherein said standard has a pair of side surfaces which extend rearward from said front surface which side surfaces of said standard are provided with apertures and wherein said reentrant means on said bracket comprises lugs which are received by said apertures.

5. A structure in accordance with claim **1** wherein said re-entrant surfaces are substantially parallel to said front surface of said standard and wherein said first flange portion and said re-entrant flange of said bracket are likewise substantially parallel.

6. A structure in accordance with claim **1** wherein said elongated members are unconnected for a distance from the midpoint to the inner end of said support arm.

7. A structure in accordance with claim **6** wherein said points of joinder of said elongated members span a distance at least equal to about **10** percent of the length of said elongated members.

8. A structure in accordance with claim **1** wherein said arm includes brace means near the inner end thereof which extends diagonally downward from each of said elongated members to said bracket and also provides a support surface to retain horizontal decking.

9. A structure in accordance with claim **1** wherein said standard has the cross sectional shape of the general outline of an "I."

* * * * *